

AMENDMENTS TO THE CLAIMS

The claims in this listing will replace all prior versions, and listings, of claims in the application.

Claims 1-11. (Cancelled)

12. (Currently Amended) A three-dimensional image capturing device, comprising:

a light source that radiates a distance measuring light beam irradiating a measurement subject, the measurement subject reflecting the distance measuring light beam to generate a reflected light beam;

a plurality of photoelectric conversion elements, configured in a matrix arrangement, that receive the reflected light beam, said photoelectric conversion elements accumulating electric charge corresponding to at least distance information based on an amount of the received reflected light beam;

a vertical transfer unit that is disposed along each vertical line of said photoelectric conversion elements, said photoelectric conversion elements transferring the accumulated electric charge in a vertical direction;

a horizontal transfer unit that is disposed near one end of said vertical transfer unit and in parallel with horizontal lines of said photoelectric conversion elements, so that the electric charge is transferred in a horizontal direction;

an electric charge transfer processor that transfers electric charge accumulated only in photoelectric conversion elements comprising effective horizontal lines, which are disposed every predetermined number of the horizontal lines, the predetermined number being at least equal to two;

an electric charge integrating processor that drives said electric charge transfer processor repeatedly and integrates the electric charge accumulated in said photoelectric conversion elements comprising the effective horizontal lines in said vertical transfer unit; and

a transfer operation control processor that controls said horizontal transfer unit and said vertical transfer unit, so that said horizontal transfer unit is driven only when the electric charge corresponding to the effective horizontal lines is transferred to said horizontal transfer unit.

13. (Currently Amended) A device according to claim ~~12~~, 14, wherein ~~the horizontal lines are separated into a plurality of groups and~~ the effective horizontal lines comprise at least one of the groups.

14. (Currently Amended) A three-dimensional image capturing device, comprising:

a light source that radiates a distance measuring light beam irradiating a measurement subject, the measurement subject reflecting the distance measuring light beam to generate a reflected light beam;

a plurality of photoelectric conversion elements, configured in a matrix arrangement, that receive the reflected light beam, said photoelectric conversion elements accumulating electric charge corresponding to at least distance information based on an amount of the received reflected light beam;

a vertical transfer unit that is disposed along each vertical line of said photoelectric conversion elements, said photoelectric conversion elements transferring the accumulated electric charge in a vertical direction;

a horizontal transfer unit that is disposed near one end of said vertical transfer unit and in parallel with horizontal lines of said photoelectric conversion elements, so that the electric charge is transferred in a horizontal direction;

an electric charge transfer processor that transfers electric charge accumulated only in photoelectric conversion elements comprising effective horizontal lines, which are disposed every predetermined number of the horizontal lines;

an electric charge integrating processor that drives said electric charge transfer processor repeatedly and integrates the electric charge accumulated in said photoelectric conversion elements comprising the effective horizontal lines in said vertical transfer unit; and

a transfer operation control processor that controls said horizontal transfer unit and said vertical transfer unit, so that said horizontal transfer unit is driven only when the electric charge corresponding to the effective horizontal lines is transferred to said horizontal transfer unit.

~~A device according to claim 13, wherein the horizontal lines are separated into first, second and third groups, which are arranged in a vertical direction such that an order of first group, second group, second group, third group, second group, second group is repeated.~~

15. (Previously Presented) A device according to claim 12, further comprising an electric charge discharging processor that starts accumulating the electric charge in said photoelectric conversion elements by discharging unwanted charge accumulated in said photoelectric conversion elements,

wherein said electric charge integrating processor is operated by driving said electric charge discharging processor and said electric charge transfer processor alternately.

16. (Previously Presented) A device according to claim 15, wherein said photoelectric conversion elements are formed on a substrate, and said electric charge discharging processor discharges the unwanted charge to said substrate.

17. (Previously Presented) A device according to claim 16, wherein said photoelectric conversion elements begin accumulating the electric charge corresponding to at least distance information of the measurement subject when an output of an electric discharging signal, which discharges the unwanted charge in said electric charge discharging processor, ends.

18. (Previously Presented) A device according to claim 17, wherein said light source radiates a pulsed beam of said distance measuring light beam during a first accumulating period, which is from an output of said electric charge discharging signal to an output of said electric charge transfer signal, and said electric charge corresponding to distance information regarding said measurement subject is integrated in said vertical transfer unit of said effective horizontal lines.

19. (Previously Presented) A three-dimensional image capturing device, comprising:

a light source that irradiates a measurement subject;

a plurality of photoelectric conversion elements, arranged in a matrix, that receive an amount of light reflected from the measurement subject and that accumulate electric charge corresponding the received amount of light said photoelectric conversion

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elements comprising first photoelectric conversion elements and second photoelectric conversion elements, a number of said second photoelectric conversion elements being less than a number of said first photoelectric conversion elements;

an electric charge transfer control processor that controls an electric transfer operation, which outputs the electric charge accumulated in said photoelectric conversion elements;

a distance calculating processor that calculates a distance to the measurement subject based on the amount of electric charge accumulated in said photoelectric conversion elements;

a first distance measuring processor that drives said electric charge transfer control processor to output the electric charge accumulated in all said photoelectric conversion elements, and calculates the distance corresponding to all said photoelectric conversion elements using said distance calculating processor;

a second distance measuring processor that drives said electric charge transfer control processor in order to output the electric charge accumulated in selected photoelectric conversion elements of the plurality of photoelectric conversion elements, and calculates the distance corresponding to said selected photoelectric conversion elements using said distance calculating processor; and

a distance measurement selecting processor that selects one of said first distance measuring processor and said second distance measuring processor, and drives the selected processor;

wherein said second distance measuring processor comprises:

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a first high speed mode that drives said electric charge transfer control processor to output electric charge from said first photoelectric conversion elements, and that calculates the distance corresponding to said first photoelectric conversion elements; and

a second high speed mode that drives said electric charge transfer control processor to output electric charge from said second photoelectric conversion elements, and that calculates the distance corresponding to said second photoelectric conversion elements; and

wherein said first high speed mode calculates the distance when the measurement subject is moving at a relatively slow speed and said second high speed mode calculates the distance when the measurement subject is moving at a relatively fast speed.

20. (Canceled)

21. (Previously Presented) A device according to claim 19, wherein said first distance measuring processor measures a stationary measurement subject and said second distance measuring processor measures a moving measurement subject.

22. (Canceled)

23 (Previously Presented) A device according to claim 13, wherein each of the plurality of groups shares at least one of the horizontal lines.

24 (Previously Presented) A device according to claim 23, wherein the plurality of groups comprises at least three groups.

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25 (New) A device according to claim 12, wherein the horizontal lines are separated into a plurality of groups and the effective horizontal lines comprise at least one of the groups.

26 (New) A device according to claim 25, wherein each of the plurality of groups shares at least one of the horizontal lines.